



Natural Heritage & Endangered Species Program

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Arrow Clubtail Dragonfly *Stylurus spiniceps*

State Status: **Threatened**
Federal Status: None

DESCRIPTION: The Arrow Clubtail is a large, semi-aquatic insect in the order Odonata, suborder Anisoptera (the dragonflies). The nymph is aquatic, and the adult terrestrial. Like all dragonflies, the adult Arrow Clubtail has a long, slender abdomen, four veined wings (two fore wings and two hindwings), and a large head with huge eyes and powerful, chewing mouth parts. It is a member of the family Gomphidae (the clubtails), a diverse group with nearly one hundred species in North America. Clubtails are named for the lateral swelling at the tip of the abdomen (the seventh through ninth segments) that produces a club-like appearance. The extent of this swelling varies greatly, from extreme to non-existent, depending upon the species. The club is generally more pronounced in males than females. The purpose of the club is uncertain, but it may be used for displays, or it may provide some aerodynamic benefits to the males. Clubtails are further distinguished from other dragonflies by their widely separated eyes, wing venation characteristics, and behavior. Many species are very elusive and thus poorly known.

The Arrow Clubtail is in the genus *Stylurus*, the so-called “hanging clubtails”, a group characterized by having moderately flared clubs and relatively short legs. They typically perch high in the tree tops on the upper surface of leaves, in a vertical position. Arrow Clubtails are brownish in coloration with pale yellow to green markings on the body and bright green eyes. The top of the thorax is marked with thin, pale yellow or green stripes. The sides of the thorax are mostly pale, with narrow, dark lateral stripes. The pale thoracic markings are bright yellow in the young adults, but become a dull, gray-green as the insect matures. The dark brown abdomen is unusually long for a clubtail, with a strikingly long ninth segment. The abdomen is marked with yellow spots on the dorsal surface and elongate yellow spots on the sides. The face is dull yellowish-brown, and the legs are black. The sexes are similar in appearance, though the females have thicker abdomens with only a slight swelling on segments eight and nine. Arrow Clubtails range in length from 2.1 to 2.55 inches (54 mm - 65 mm), with a wingspan averaging about 2.75 inches (70 mm). The males average somewhat larger than the females. The distinctive nymphs average about 1.5 inches in length (36 mm - 41 mm) when fully mature.

SIMILAR SPECIES: The Arrow Clubtail is one of three species in the genus *Stylurus* in Massachusetts. It differs from the other two in a number of features. As in most dragonflies, the shapes of the male’s terminal appendages and hamules



(located on the underside of the second abdominal segment), and the female’s vulvar lamina (located on the underside of the eighth and ninth abdominal segments) provide the most reliable means of identification. Another distinctive feature of the Arrow Clubtail is an unusually long ninth abdominal segment. The Riverine Clubtail (*Stylurus amnicola*) is smaller and has yellowish tibiae on the rear legs. The Zebra Clubtail (*Stylurus scudderi*) is a large, dark species with distinctive yellow rings around the abdomen. The Cobra Clubtail (*Gomphus vastus*), Midland Clubtail (*G. fraternus*), and Skillet Clubtail (*G. ventricosus*) are similar, but have much broader dorsal stripes on the thorax and differ in features of the male terminal appendages and hamules, and the female vulvar lamina.

The nymph of the Arrow Clubtail is quite distinctive. The ninth abdominal segment is very elongate, giving the impression of a long tubular extension. Additional distinguishing features are given in the keys of Walker (1958), Soltesz (1996), and Needham *et al.* (2000).

ARROW CLUBTAIL FLIGHT PERIOD

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
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HABITAT: The nymphs of Arrow Clubtails inhabit medium to large, swift-flowing, sandy-bottomed rivers and occasionally large, wind-swept lakes. The adults inhabit riparian areas and the surrounding upland.

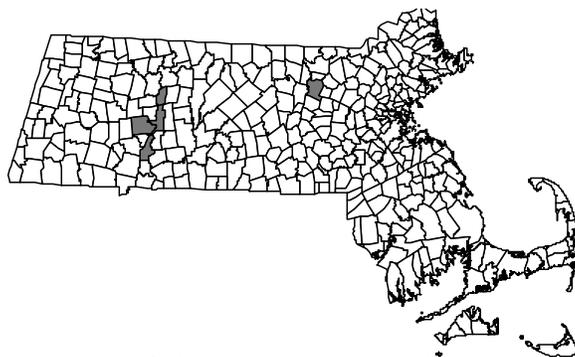
LIFE-HISTORY/BEHAVIOR: Like most *Stylurus*, they have a late flight season with adults on the wing from mid-July into late September.

Arrow Clubtails are elusive and little is known about their life history. The aquatic nymphs spend at least a year, probably more, maturing, undergoing several molts during this period. Like most clubtails, they are burrowers, and reportedly burrow more deeply into the sandy substrate than any other species. They are voracious predators and feed upon a variety of aquatic life. When ready to emerge, the nymphs crawl out onto exposed rocks, emergent vegetation, partially submerged logs, or the steeper sections of river banks, where they undergo transformation to adults — a process known as “eclosion.” Emergence generally takes place very early in the morning, presumably to reduce exposure to predation. The cast skins, known as exuviae, are easily found and provide a reliable means of confirming the presence of a breeding population.

As soon as the freshly emerged adults (tenerals) are dry and the wings have hardened sufficiently, they fly off to seek refuge in the vegetation of adjacent uplands. Here they spend several days or more feeding and maturing, before returning to their breeding habitats. Arrow Clubtails are seldom encountered during this phase of their life; it may be that they spend most of this time high in the tree tops. Clubtails feed on aerial insects which they capture with short sallies from their perches.

When mature, the males return to the water where they can be seen patrolling low over the swifter flowing portions, presumably to search for females and drive away competing males. They are very wary and, unlike many clubtails, seem to avoid perching on the shore, or protruding rocks and logs. When not over the water, they apparently spend their time high in the tree tops. As is typical of *Stylurus*, Arrow Clubtails are most active late in the day. Females generally appear at water only for a brief period when they are ready to mate and lay eggs. The duration of mating in Arrow Clubtails has not been recorded, but in similar-sized odonates typically lasts from several minutes to an hour or more. Females oviposit by flying low over the water, periodically striking the surface with the tips of the abdomen to wash off the eggs. It is not known how long the eggs of Arrow Clubtails take to develop.

RANGE: Arrow Clubtails range throughout much of eastern North America from Ontario, Quebec, and New Hampshire south to Georgia, Mississippi, and Arkansas. In addition to Massachusetts, the species has been recorded in New England from Connecticut (several recent records from the Connecticut River), Vermont (two older records), and southern New Hampshire.



Distribution in Massachusetts
1977 - 2002

Based on records in Natural Heritage Database

POPULATION STATUS IN MASSACHUSETTS: The Arrow Clubtail is listed as a Threatened Species in Massachusetts. As with all species listed in Massachusetts, individuals of the species are protected from take (picking, collecting, killing, etc...) and sale under the Massachusetts Endangered Species Act. Recent records of Arrow Clubtail in the state are from the Connecticut River, particularly in the Sunderland-Deerfield area. There are also single historical records from Lawrence and Concord. The species could conceivably occur elsewhere in the state, with the Merrimack and Housatonic rivers perhaps offering suitable habitat.

MANAGEMENT RECOMMENDATIONS: As for many rare species, the exact management needs of Arrow Clubtails are not known. Water quality certainly is a primary concern. Potential threats to the water quality of the Connecticut River include industrial pollution from businesses located along the river, salt and other road contaminant run-off, and siltation from construction or erosion. The disruption of natural flooding regimes by dams and water diversion projects also may have a negative impact on odonate populations. Extensive use of the river by power boats and jet skis is a serious concern, particularly during the early summer emergence period of Arrow Clubtails (and several other clubtail species). Many species of clubtails and other riverine odonates undergo emergence near the water on exposed rocks or vegetation, or exposed sections of the river bank, where they are imperiled by the wakes of high speed watercraft. Low-level recreational use from fisherman and canoeists probably has little impact on odonate populations, but should be monitored. The upland borders of these river systems are also crucial to the well-being of odonate populations as they are critical for feeding, resting, and maturation. Development of these areas should be discouraged and preservation of the remaining undeveloped upland bordering the river should be a top priority.

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